

WHAT IS CLAIMED IS:

1                   1.       A method of dithering an image, the method comprising the acts of:  
2                   receiving a target color at a high color resolution for a current one of a plurality of  
3 pixels of the image, the target color being intermediate between a first color and a second color  
4 at a low color resolution;  
5                   tracking an accumulated error across the plurality of pixels up to and including  
6 the current pixel;  
7                   selecting one of the first color and the second color as a final pixel color, wherein  
8 the first color is selected in the event that the accumulated error is less than a threshold, wherein  
9 the second color is selected in the event that the accumulated error exceeds the threshold, and  
10 wherein the accumulated error is reduced below the threshold in the event that the second color  
11 is selected; and  
12                   providing an updated accumulated error to a next one of the plurality of pixels.

1                   2.       The method of claim 1, wherein the act of tracking the accumulated error  
2 includes the acts of:  
3                   determining a current error based on a difference between the first color and the  
4 target color; and  
5                   adding the current error to the accumulated error.

1                   3.       The method of claim 2, further comprising the act of reducing the  
2 accumulated error by an amount corresponding to the threshold in the event that the second color  
3 is selected.

1                   4.       The method of claim 1, wherein the act of selecting includes:  
2                   adding the accumulated error to the target color, thereby obtaining a modified  
3 target color;  
4                   selecting the first color as the final pixel color in the event that the modified target  
5 color is intermediate between the first color and the second color; and  
6                   selecting the second color as the final pixel color in the event that the modified  
7 target color is not intermediate between the first color and the second color.

1                   5.     The method of claim 4, wherein the act of providing the accumulated error  
2 includes storing the difference between the modified target color and the final pixel color as an  
3 updated accumulated error.

1                   6.     The method of claim 1, wherein the plurality of pixels corresponds to a  
2 scan line of a display device.

1                   7.     The method of claim 6, further comprising the act of initializing the  
2 accumulated error at a beginning of the scan line.

1                   8.     The method of claim 7, wherein the accumulated error is initialized to a  
2 value that depends at least in part on a line number of the scan line.

1                   9.     The method of claim 8, wherein the accumulated error is initialized to a  
2 value that is different for successive frames.

1                   10.    The method of claim 1, wherein the threshold corresponds to a difference  
2 between respective high resolution representations of the first color and the second color.

1                   11.    The method of claim 1, wherein the target color is one of a plurality of  
2 independent color components for the pixel.

1                   12.    A device for dithering an image, the device comprising:  
2                   an accumulator module configured to track an accumulated error across a  
3 plurality of pixels of the image;  
4                   a conversion module configured to receive a high resolution color signal for a  
5 current pixel of the image and to generate a corresponding low resolution color signal; and  
6                   an adjustment module configured to modify the low resolution color signal for the  
7 current pixel in the event that the accumulated error exceeds a threshold,  
8                   wherein after processing the current pixel, the accumulated error is provided to a  
9 next one of the plurality of pixels.

1                   13.    The device of claim 12, wherein the accumulator module includes:

2 a current error circuit configured to extract a current error from the high  
3 resolution color signal for the current pixel; and  
4 a first adder circuit configured to add the current error to the accumulated error  
5 and to provide an updated accumulated error to the adjustment module.

1 14. The device of claim 13, wherein the adjustment module includes:  
2 a comparator circuit configured to compare the updated accumulated error to a  
3 threshold, thereby generating a dither control signal; and  
4 a second adder circuit configured to receive the low resolution color signal from  
5 the conversion module and to adjust the received low resolution color signal based on the dither  
6 control signal, thereby generating a final color signal.

1 15. The device of claim 14, wherein the comparator circuit is further  
2 configured to provide the dither control signal as a feedback signal to the accumulator module,  
3 and wherein the accumulator module is further configured to reduce the accumulated error based  
4 on the dither control signal.

1 16. The device of claim 12, wherein the accumulator module includes a  
2 register configured to store the accumulated error.

1 17. The device of claim 12, wherein the adjustment circuit includes an adder  
2 circuit configured to add the accumulated error to the high resolution color signal, thereby  
3 generating an intermediate color signal.

1 18. The device of claim 17, wherein the conversion circuit includes a truncator  
2 circuit configured to reduce the intermediate color signal to a low resolution color signal.

1 19. The device of claim 18, wherein the truncator circuit is further configured  
2 to reduce the intermediate color signal by removing a number of least significant bits and to store  
3 the removed least significant bits in the register as a new accumulated error.

1 20. A graphics processing unit comprising:  
2 a geometry pipeline unit configured to generate pixel data for an image; and  
3 a scanout module configured to provide the pixel data to a display device,

4                    wherein the scanout module includes a dithering unit, the dithering unit  
5 comprising:  
6                    an accumulator module configured to track an accumulated error across a  
7 plurality of pixels of the image;  
8                    a conversion module configured to receive a high resolution color signal  
9 for a current pixel of the image and to generate a corresponding low resolution color  
10 signal; and  
11                    an adjustment module configured to modify the low resolution color signal  
12 for the current pixel in the event that the accumulated error exceeds a threshold.